Up to PL e of EN ISO 13849-1
PNOZ X1



Safety relay for monitoring E-STOP pushbuttons

Approvals

	PNOZ X1
c UL us LISTED	◆
TÜV SÜDDEUTSCHLAND	◆
CCC	◆

Unit features

- Positive-guided relay outputs:
  - 3 safety contacts (N/O), instantaneous
  - 1 auxiliary contact (N/C), instantaneous
- Safe separation of safety contacts 13-14, 23-24, 33-34 from input circuits A1-A2, feedback loop Y1-Y2 and auxiliary contact 41-42.
- Connection options for:
  - E-STOP pushbutton
  - Reset button
- LED indicator for:
  - Switch status channel 1/2
  - Supply voltage

Unit description

The safety relay meets the requirements of EN 60204-1 and IEC 60204-1 and may be used in applications with

- E-STOP pushbuttons

The safety relay is not suitable for non-contact barriers because

- a dynamic start is not possible
- the unit can be started during the delay-on de-energisation time.

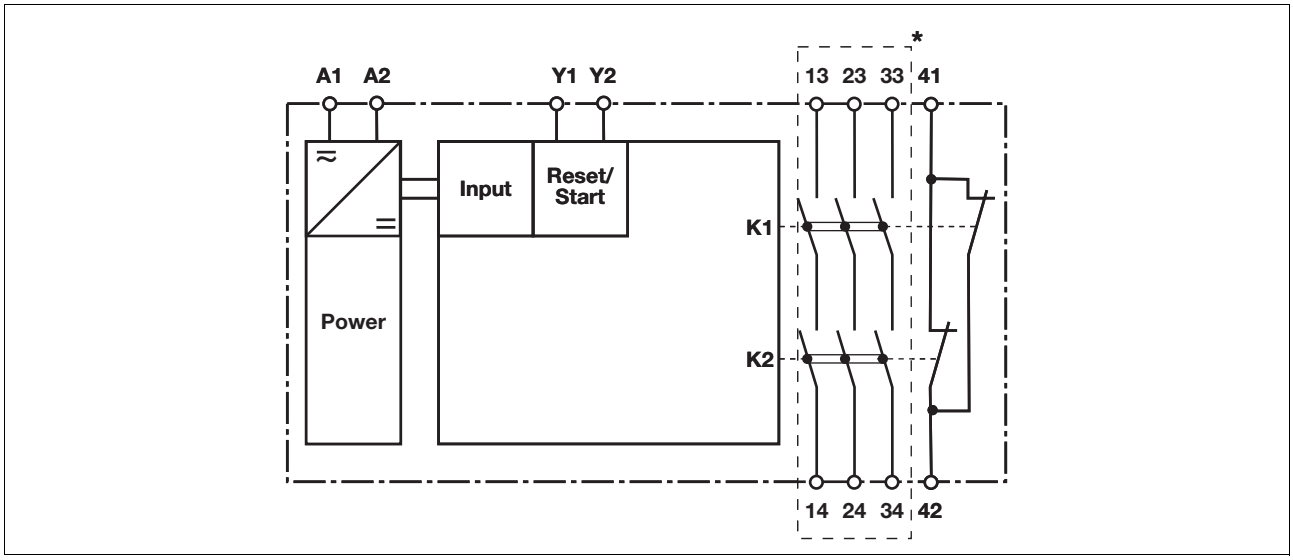
Safety features

The relay meets the following safety requirements:

- The circuit is redundant with built-in self-monitoring.
- The safety function remains effective in the case of a component failure.
- The correct opening and closing of the safety function relays is tested automatically in each on-off cycle.

Block diagram

***** Safe separation in accordance with EN 60947-1, 6 kV (see unit features)



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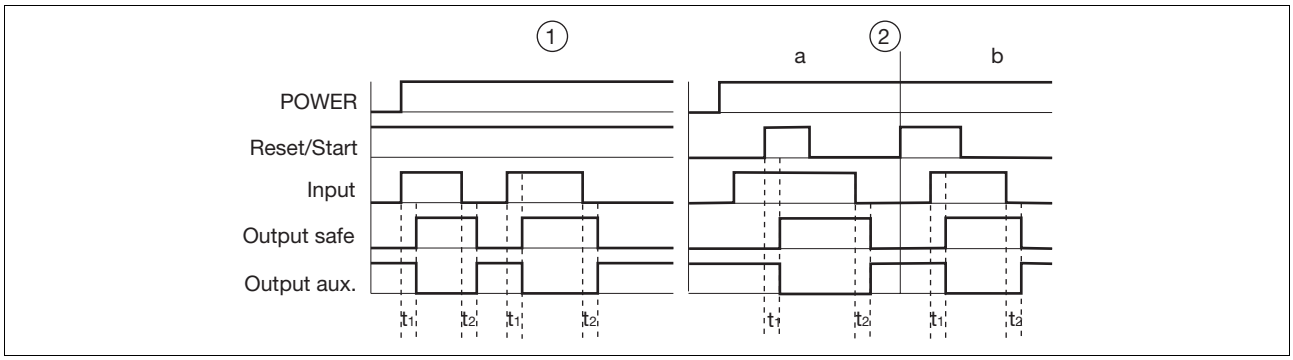
Function description

- Single-channel operation: no redundancy in the input circuit, earth faults in the reset circuit are detected.
- Automatic start: Unit is active once the input circuit has been closed.
- Manual reset: Unit is active once the input circuit is closed and then the reset circuit is closed.
- Increase in the number of available instantaneous safety contacts by connecting contact expansion modules or external contactors.

Timing diagram



Key

- Power: Supply voltage
- Reset/start: Reset circuit Y1-Y2
- Input: Input circuits A1-L+
- Output safe: Safety contacts 13-14, 23-24, 33-34
- Output aux: Auxiliary contacts 41-42
- ①: Automatic reset
- ②: Manual reset
- a: Input circuit closes before reset circuit
- b: Reset circuit closes before input circuit
- t_1: Switch-on delay
- t_2: Delay-on de-energisation

Wiring

Please note:

- Information given in the “Technical details” must be followed.
- Outputs 13-14, 23-24, 33-34 are safety contacts, output 41-42 is an auxiliary contact (e.g. for display).
- To prevent contact welding, a fuse should be connected before the output contacts (see technical details).
- Calculation of the max. cable runs I_{max} in the input circuit:

$$I_{max} = \frac{R_{lmax}}{R_l / km}$$

R_{lmax} = max. overall cable resistance (see technical details)
R_l /km = cable resistance/km

- Use copper wire that can withstand 60/75 °C.
- Sufficient fuse protection must be provided on all output contacts with capacitive and inductive loads.

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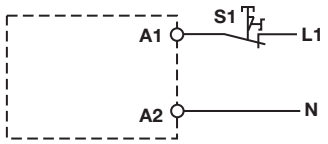
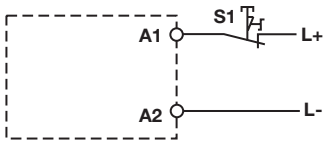
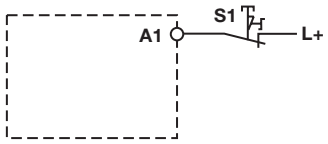
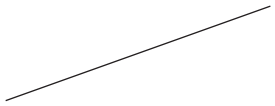
Preparing for operation

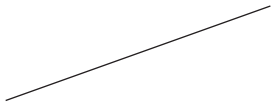
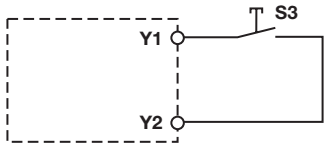
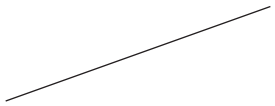
- Supply voltage

Supply voltage	AC	DC
		

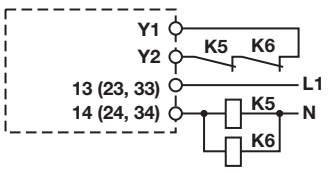
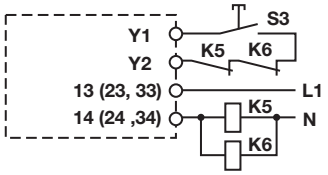
- Input circuit

Input circuit	Single-channel	Dual-channel
E-STOP **without** detection of shorts across contacts		

- Reset circuit

Reset circuit	E-STOP wiring (single-channel)	E-STOP wiring (dual-channel)
Automatic reset		
Manual reset		

- Feedback loop

Feedback loop	Automatic reset	Manual reset
Contacts from external contactors		

- Key

S1	E-STOP pushbutton
S3	Reset button

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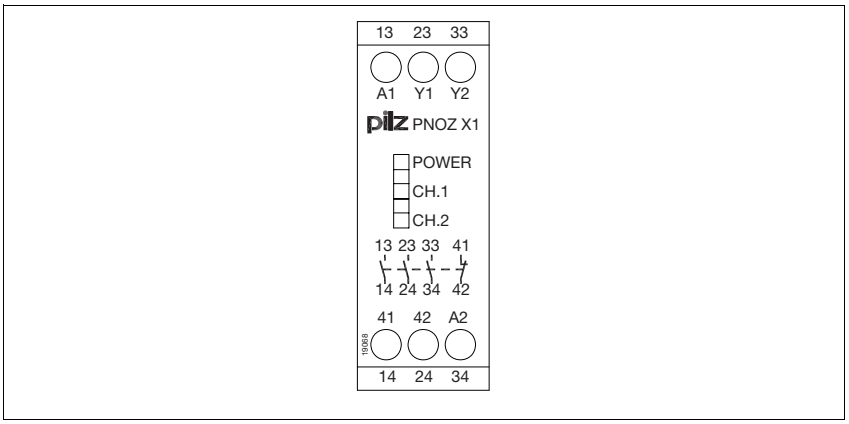
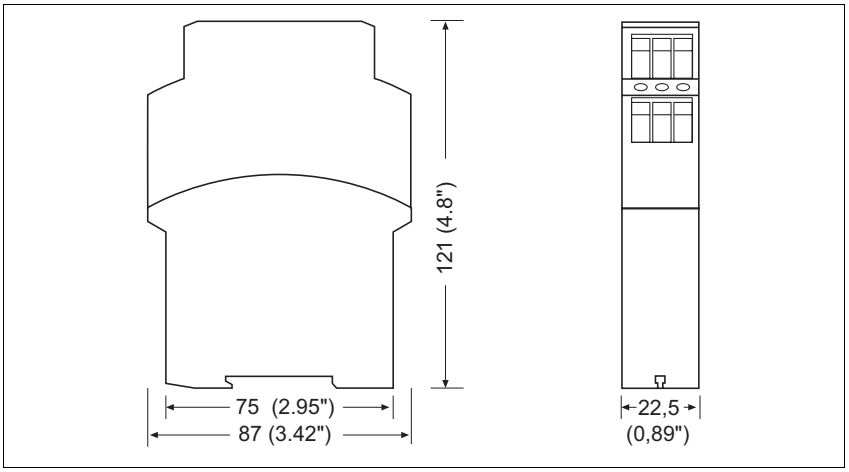
Terminal configuration



Installation

- The safety relay should be installed in a control cabinet with a protection type of at least IP54.
- Use the notch on the rear of the unit to attach it to a DIN rail.
- Ensure the unit is mounted securely on a vertical DIN rail (35 mm) by using a fixing element (e.g. retaining brakket or an end angle).

Dimensions



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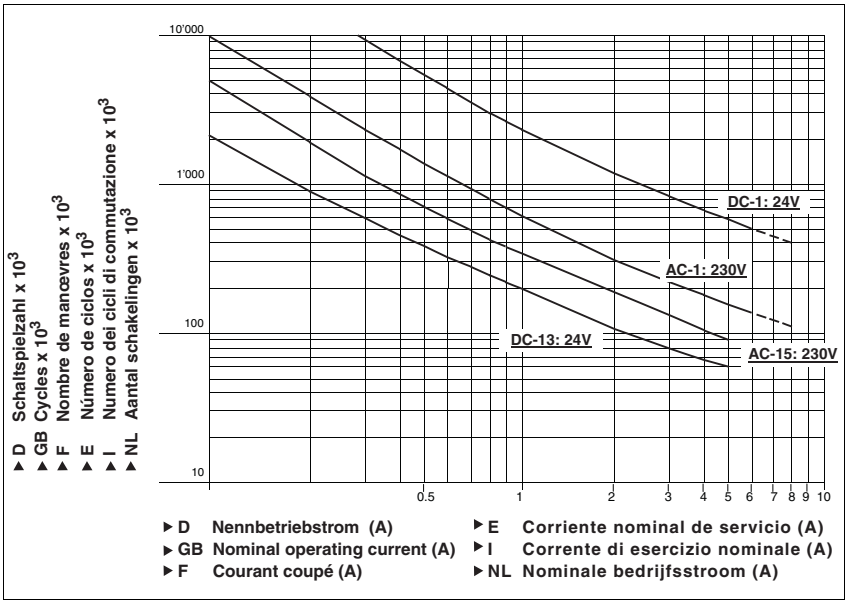
Notice

This data sheet is only intended for use during configuration. For installation and operation, please refer to the operating instructions supplied with the unit.

Service life graph



Technical details

Electrical data	
Supply voltage	
Supply voltage U_B AC/DC	**24 V**
Voltage tolerance	**-15 %/+10 %**
Power consumption at U_B AC	**4.0 VA**
Power consumption at U_B DC	**2.0 W**
Frequency range AC	**50 - 60 Hz**
Residual ripple DC	**160 %**
Voltage and current at	
Input circuit DC: **24.0 V**	**70.0 mA**
Reset circuit DC: **24.0 V**	**40.0 mA**
Feedback loop DC: **24.0 V**	**40.0 mA**
Number of output contacts	
Safety contacts (S) instantaneous:	**3**
Auxiliary contacts (N/C):	**1**
Utilisation category in accordance with **EN 60947-4-1**	
Safety contacts: AC1 at **240 V**	I_{min}: **0.01 A** , I_{max}: **6.0 A** P_{max}: **1500 VA**
Safety contacts: DC1 at **24 V**	I_{min}: **0.01 A** , I_{max}: **6.0 A** P_{max}: **150 W**
Auxiliary contacts: AC1 at **240 V**	I_{min}: **0.01 A** , I_{max}: **6.0 A** P_{max}: **1500 VA**
Auxiliary contacts: DC1 at **24 V**	I_{min}: **0.01 A** , I_{max}: **6.0 A** P_{max}: **150 W**
Utilisation category in accordance with **EN 60947-5-1**	
Safety contacts: AC15 at **230 V**	I_{max}: **5.0 A**
Safety contacts: DC13 at **24 V** (6 cycles/min)	I_{max}: **5.0 A**
Auxiliary contacts: AC15 at **230 V**	I_{max}: **5.0 A**
Auxiliary contacts: DC13 at **24 V** (6 cycles/min)	I_{max}: **5.0 A**
Contact material	**AgCuNi + 0.2 µm Au**

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Electrical data	
External contact fuse protection (I_K = 1 kA) to **EN 60947-5-1**	
Blow-out fuse, quick	
Safety contacts:	**10 A**
Auxiliary contacts:	**10 A**
Blow-out fuse, slow	
Safety contacts:	**6 A**
Auxiliary contacts:	**6 A**
Circuit breaker 24 VAC/DC, characteristic B/C	
Safety contacts:	**6 A**
Auxiliary contacts:	**6 A**
Max. overall cable resistance R_{lmax} input circuits, reset circuits	
single-channel at U_B DC	**30 Ohm**
single-channel at U_B AC	**30 Ohm**
Safety-related characteristic data	
PL in accordance with **EN ISO 13849-1**	**PL e** (**Cat. 4**)
Category in accordance with **EN 954-1**	**Cat. 4**
SIL CL in accordance with **EN IEC 62061**	**SIL CL 3**
PFH in accordance with **EN IEC 62061**	**2.31E-09**
SIL in accordance with **IEC 61511**	**SIL 3**
PFD in accordance with **IEC 61511**	**2.03E-06**
t_M in years	**20**
Times	
Switch-on delay	
with automatic reset typ.	**60 ms**
with automatic reset max.	**120 ms**
with manual reset typ.	**50 ms**
with manual reset max.	**120 ms**
Delay-on de-energisation	
with E-STOP typ.	**55 ms**
with E-STOP max.	**90 ms**
with power failure typ.	**55 ms**
with power failure max.	**90 ms**
Recovery time at max. switching frequency 1/s	
after E-STOP	**150 ms**
after power failure	**150 ms**
Supply interruption before de-energisation	**20 ms**
Environmental data	
EMC	**EN 60947-5-1**, **EN 61000-6-2**
Vibration to **EN 60068-2-6**	
Frequency	**10 - 55 Hz**
Amplitude	**0.35 mm**
Climatic suitability	**EN 60068-2-78**
Airgap creepage in accordance with **EN 60947-1**	
Pollution degree	**2**
Overvoltage category	**III**
Rated insulation voltage	**250 V**
Rated impulse withstand voltage	**6.00 kV**
Ambient temperature	**-10 - 55 °C**
Storage temperature	**-40 - 85 °C**
Protection type	
Mounting (e.g. cabinet)	**IP54**
Housing	**IP40**
Terminals	**IP20**

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Mechanical data	
Housing material	
Housing	**PPO UL 94 V0**
Front	**ABS UL 94 V0**
Cross section of external conductors with screw terminals	
1 core flexible	**0.20 - 4.00 mm² , 24 - 10 AWG**
2 core, same cross section, flexible:	
with crimp connectors, without insulating sleeve	**0.20 - 2.50 mm² , 24 - 14 AWG**
without crimp connectors or with TWIN crimp connectors	**0.20 - 2.50 mm² , 24 - 14 AWG**
Torque setting with screw terminals	**0.60 Nm**
Dimensions	
Height	**87.0 mm**
Width	**22.5 mm**
Depth	**121.0 mm**
Weight	**180 g**

The standards current on **2009-12** apply.

Conventional thermal current

Number of contacts	I_{th} (A) at U_B DC	I_{th} (A) at U_B AC
1	**6.00 A**	**6.00 A**
2	**6.00 A**	**6.00 A**
3	**5.00 A**	**5.00 A**

Order reference

Type	Features		Terminals	Order no.
PNOZ X1	24 VAC	24 VDC	Screw terminals	774 300